1. Log in to your Sage Cloud account.
   (a) Start the Chrome browser.
   (b) Go to http://cloud.sagemath.com and sign in.
   (c) You should see an existing Project for our class. Click on that.
   (d) Click “New”, call it c11, then click “Sage Worksheet”.

2. **Warm-ups.** What will the following commands return in Sage? Answer and then use Sage to check.
   (a) is_prime(245); is_prime(23)
   (b) even = lambda x: x%2==0; even(6); even(7)
   (c) L=[2..10]; len(L)
   (d) [k**2 for k in L]
   (e) n=6
       if n<7:
           print "{} is less than 7".format(n)
   (f) n=6
       if n<5:
           print "{} is less than 7".format(n)
   (g) i=0
       while i<7:
           print i
           i=i+1

**Programming**

3. What will the following code do?

```python
def mystery1(n):
    L=[1..n]
    even = lambda x: x%2==0
    print [even(k) for k in L]
mystery1(9)

def mystery2(n):
    M=[]
    even = lambda x: x%2==0
    for i in [1..n]:
        if even(i)==True:
            M.append(i)
    print M
mystery2(9)
```

A *while loop* runs a block of code while a condition is still satisfied. A common way to use a while loop is in a test where you don’t know precisely when the test condition will be met.

4. What will the following code do?

```python
def mystery3(n):
    M=[]
    i=0
    even = lambda x: x%2==0
    while i<n:
        if even(i)==True:
            M.append(i)
        i=i+1
    print M
mystery3(9)
```

5. Write a definition for a function that prints the lists [1..i] for i=0 to i=4. Use a while loop. Evaluate and test. Now try to write a definition for a function that prints the lists [1..i] for i=0 to i=n.

6. Now try to write a definition for a function that prints the lists [1..i] for i=0 to i=n. Evaluate and test.

If \( f(x) \) is a continuous function, and \( f(a) \leq c \leq f(b) \) then there is some real number \( x \) in the interval \( [a,b] \) where \( f(x) = c \) (that’s the Intermediate Value Theorem). We will define a function that finds this \( x \). We will do this in steps.

7. Given a continuous function \( f(x) \), and numbers \( a, b \) and \( c \), define a function 
   \[ \text{check_conditions}(f,a,b,c) \]
   that returns True if \( f(a) \leq c \leq f(b) \) and False otherwise. Evaluate.

8. Let \( f(x) = x^2 \). Evaluate \( \text{check_conditions}(f,1,2,3) \) and \( \text{check_conditions}(f,1,2,5) \). Is the output what you expected?

9. Given a continuous function \( f(x) \), and numbers \( a, b \) and \( c \), define a function 
   \[ \text{test_average}(f,a,b,c) \]
   that returns the tuple \( (a, (a+b)/2) \) if \( f((a+b)/2) \geq c \) and returns \( ((a+b)/2, b) \) if \( f((a+b)/2) < c \).